SECTION 5

DEVELOPMENT OF CORRECTIVE MEASURES FOR POLYCHLORINATED BIPHENYLS (PCBs)

The primary COCs present at two Berkeley Lab units are polychlorinated biphenyls (PCBs). These chemicals were primarily present as components of oils that were used in pumps and electrical devices at Berkeley Lab. PCBs are not COCs at any groundwater units. The soil units at which PCBs are COCs are:

- Building 88 Hydraulic Gate Unit (AOC 6-3)
- Building 75 Former Hazardous Waste Handling and Storage Facility (SWMU 3-6)

5.1 MEDIA CLEANUP STANDARDS FOR PCBs

Risk and Regulatory-Based MCS

On June 29, 1998, the Disposal Amendments to the Toxic Substances Control Act (TSCA) (dubbed the Megarule by industry) were published in the Federal Register (63 FR 3584). The Megarule provides cleanup options for PCBs in bulk remediation waste, including soil. The self-implementing cleanup level (i.e., the ‘‘walk-away’’ level) for soil in “high occupancy” areas is ≤1 part per million (ppm), or ≤10 ppm if the soil is capped (40 CFR §761.61(a)(4)(i)(A). The codified text uses (ppm) for concentration measurement of non-liquids as an equivalent to milligrams per kilogram (mg/kg). The TSCA cleanup level is based on an evaluation of potential risk assuming an unprotected exposure 24 hours a day, 7 days a week, and 50 weeks per year for the “high occupancy” scenario.

To ensure that the TSCA cleanup level addressed risks calculated for Berkeley Lab units, risks associated with pathways identified for the Berkeley Lab HHRA were examined. **Table 5.1-1** lists estimates of the lowest soil PCB concentrations for any PCB Aroclor that would result in a theoretical ILCR of 10^{-6} or an HI equal to 1.0 for these critical pathways and receptors, using the same methodology as was used in the HHRA (Berkeley Lab, 2003a). The minimum soil

PCB concentration that met this criterion was 0.8 mg/kg, only slightly below the TSCA cleanup level. Since PCB-contaminated soil at Berkeley Lab consists of a mixture of Aroclors, this slight discrepancy would not result in risks exceeding the USEPA target risk range.

Table 5.1-1. Derivation of Risk-Based Target MCS for PCBs in Soil

Receptor	Theoretical ILCR or HI	PCB Concentration
Landscape Maintenance Worker	Theoretical ILCR=$1x10^{-6}$	0.8 mg/kg
	Hazard Index=1	1.2 mg/kg
Construction Worker	Theoretical ILCR=$1x10^{-6}$	31.8 mg/kg
	Hazard Index=1	1.8 mg/kg

To assess whether the TSCA cleanup level could potentially result in impacts to groundwater, it was compared to the groundwater protection component of the RWQCB Environmental Screening Levels (RWQCB, 2003). That component is 6.3 mg/kg for all Aroclors, indicating that the 1 mg/kg TSCA level is protective of groundwater.

Proposed MCS for PCBs and Points of Compliance

The proposed MCS for PCBs in soil is 1 mg/kg, the self-implementing cleanup level for soil in "high" occupancy areas under TSCA. Post-remediation confirmation soil samples were collected to verify compliance with the self-implementing cleanup level.

5.2 SELECTION AND EVALUATION OF CORRECTIVE MEASURES ALTERNATIVES FOR PCBs IN SOIL

Subsequent to completion of the Berkeley Lab HHRA, which identified the two units for which PCBs are the COCs, Berkeley Lab conducted ICMs that resulted in reduction of residual PCB concentrations to less than the proposed MCS of 1 mg/kg at both the Building 88 Hydraulic Gate Unit and the Building 75 Former hazardous Waste Handling and Storage Facility. For this reason, no further evaluations of corrective measures alternatives are needed. A description of the two units, including the ICMS that were conducted, is provided in the following sections.

5.3 BUILDING 88 HYDRAULIC GATE UNIT (AOC 6-3)

The 88-Inch Cyclotron located in Building 88 is operated as a national facility in support of DOE programs in basic nuclear science. The central component is a sector-focused, variable-energy cyclotron that produces heavy-ion beams of elements throughout the periodic table. A hydraulic pump in Room 181 of Building 88 is used to operate the building's hydraulic main vault doors. The pump has probably been used since the building was constructed in 1960. A PCB-containing oil was used in the pump from 1962 to 1976. The oil was changed to a non-PCB oil in 1976. During the RFA, an oil stain approximately 10 feet long was observed on the concrete floor around the pump. The stain was probably the result of occasional drips of oil from the pump over the period of pump operation. Cleanup of the PCB stain and retrofilling and cleaning of the pump were conducted in 1991. The location of the hydraulic gate pump is shown on **Figure 5.3-1**.

5.3.1 Physiography and Geology

Building 88 is constructed on a bench cut into a steep westward and northwestward facing slope. The northwestward facing slope forms the south side of Blackberry Canyon, through which the North Fork of Strawberry Creek flows. The bedrock underlying Building 88 consists of northerly dipping marine mudstones, sandstones, and shales of the Great Valley Group. Bedrock is present at relatively shallow depths (within approximately 2 feet at some locations) under the building. Colluvium is present in scattered locations around Building 88, with the thickest deposit (approximately 25-feet thick) on the slope above the north end of Building 88. Depth to groundwater ranges from approximately 40 feet at the north end of Building 88 to more than 100 feet at the south end.

5.3.2 Contamination

Soil Contamination

Initial soil samples collected during the RFI from beneath the concrete floor near the hydraulic gate pump contained PCBs (10,000 mg/kg maximum concentration) and oil & grease (28,000 mg/kg maximum concentration). An ICM was conducted in February 1995, in which the concrete floor slab was removed from an area of approximately 12 square feet near the pump

(**Figure 5.3-1**), and additional soil samples were collected. Accessible contaminated sand was removed and the concrete slab was repaired. Additional samples were subsequently collected to assess the lateral extent of contamination, and indicated the presence of PCB concentrations of several thousand mg/kg, primarily in the base sand beneath the concrete, in an area extending from the pump area toward the southwest (**Figure 5.3-1**), where excavation could not be conducted because the presence of numerous subsurface live electrical utility lines restricted access to the contaminated soil. The HHRA indicated potential risks to human health based on the residual PCB concentrations.

In June and July 2004, a temporary shutdown of Building 88 operations allowed rerouting of electrical utility lines in the area of contaminated soil. After rerouting these lines, a second ICM was conducted that consisted of removal of PCB-contaminated soil to depths of up to 11.5 feet. Confirmation sample results from the ICM excavation had PCB concentrations less than the 1 mg/kg MCS except for two adjacent samples near the southern corner of the excavation. Three samples subsequently collected from within 1 foot of this location contained less than 1 mg/kg PCBs. An additional 0.5 feet of soil was then excavated from the area containing more than 1 mg/kg PCBs. The ICM excavation area and analytical results for confirmation samples are shown on **Figure 5.3-2**.

Groundwater Contamination

Groundwater monitoring well MW88-93-13, which is located at the southwest corner of Building 88, was sampled for PCBs in 2000. No PCBs were detected.

5.3.3 Conceptual Model

The information given above is the basis for the following conceptual model describing the distribution and fate of contaminants in the Building 88 Hydraulic Gate Unit:

- The only COCs were PCBs
- No PCBs have been detected in groundwater, so soil is the only media of concern.
- ICMs that removed PCB-contaminated soil have reduced PCB concentrations in residual soil to levels below the 1 mg/kg MCS.

Evaluation of Retained Corrective Measures Alternatives

No Further Action is recommended for the Building 88 Hydraulic Gate unit. Since MCSs have been achieved, no comprehensive evaluation of the other corrective measures alternatives was completed for this unit.

5.4 BUILDING 75 FORMER HAZARDOUS WASTE HANDLING AND STORAGE FACILITY (SWMU 3-6)

The former Hazardous Waste Handling Facility (HWHF) at Building 75 was used from about 1962 until 1998 to store wastes generated at Berkeley Lab, pending disposal offsite (**Figure 5.4-1**). Wastes included waste oils (both PCB-containing and non-PCB-containing), asbestos, acids, tritium, chlorides, nitrites, organic and inorganic solvents, empty hazardous chemical or waste drums, and other materials. The facility was also used to handle, store, package, and solidify radioactive waste. During operation, drums containing waste acids were kept on pallets with secondary containment. Lockers within the area were used for storing hazardous materials on shelves. PCB-containing oils were stored within a diked, fenced area outside the building.

A closure investigation conducted during 1997 and 1998 resulted in closure certification for the facility from the DTSC in July 1998, conditional on the unit being included in the Corrective Measures Study Process. Numerous soil samples were collected from borings drilled both inside the boundaries of the former HWHF and immediately outside its perimeter. An ICM has been conducted at the unit that consisted of excavating soil with concentrations of PCBs above 1 mg/kg from the "J pad" area west of Building 75A.

5.4.1 Physiography and Geology

Prior to development of the site, the Building 75 area was situated on the west edge of Chicken Creek Canyon, a major north-south-trending drainage course, which flowed downslope towards Building 77. During development, hillside cuts and canyon filling resulted in placement of artificial fill from 25 to 50 feet thick within the canyon in the vicinity of Building 69A. This created the relatively flat site on which Building 75 and adjacent buildings and parking areas are currently located. Artificial fill is absent just west of Building 75 and thickens eastwards towards the former canyon. The main bedrock unit underlying the artificial fill and colluvium in

the Building 75 area is the Orinda Formation, which consists of nonmarine siltstones and fine-grained sandstones. The Orinda Formation is overlain in the area upslope from Building 75 by volcanic rocks of the Moraga Formation.

Shallow groundwater in the Building 75 area is present in both the Orinda Formation and the surficial units (i.e., alluvium, colluvium, and artificial fill and the groundwater flows generally southeastwards.

5.4.2 Contamination

Soil Contamination

The principal contaminants in soil at the unit were PCBs (in association with crude/waste oil), which were detected primarily the vicinity of the "J pad" west of Building 75A and at the southeast corner of Building 75A. Several other site COCs (1,1,1-TCA, 1,1-DCE, cis-1,2-DCE, methylene chloride, PCE and TCE) were detected sporadically at the unit, but are only present at concentrations less than MCSs and, as described in the HHRA, were only present at concentrations below de minimis risk levels. Therefore, these chemicals are not considered to be COCs for this unit.

A series of ICMs were conducted in the PCB-contaminated areas in the Building 75 area. These ICMs were completed subsequent to completion of the HHRA. The ICMs consisted of removal and offsite disposal of soil containing PCBs at concentrations exceeding the 1 mg/kg MCS. The excavation areas and analytical results for both confirmation samples and samples from borings drilled adjacent to the ICM excavations are shown on **Figure 5.4-1**.

Groundwater Contamination

PCBs have not been detected in groundwater in the vicinity of Building 75.

5.4.3 Conceptual Model

The information given above is the basis for the following conceptual model describing the distribution and fate of contaminants for the Building 75 Former HWHF:

- The only COCs are PCBs
- No PCBs have been detected in groundwater, so soil is the only media of concern.
- ICMs that removed PCB-contaminated soil have reduced PCB concentrations in residual soil to levels below the 1 mg/kg MCS.

5.4.4 Evaluation of Retained Corrective Measures Alternatives

No Further Action is recommended for the Building 75 Former HWHF. Since MCSs have been achieved, no comprehensive evaluation of the other corrective measures alternatives was completed for this unit.